NOAA FISHERIES

Southeast Fisheries Science Center

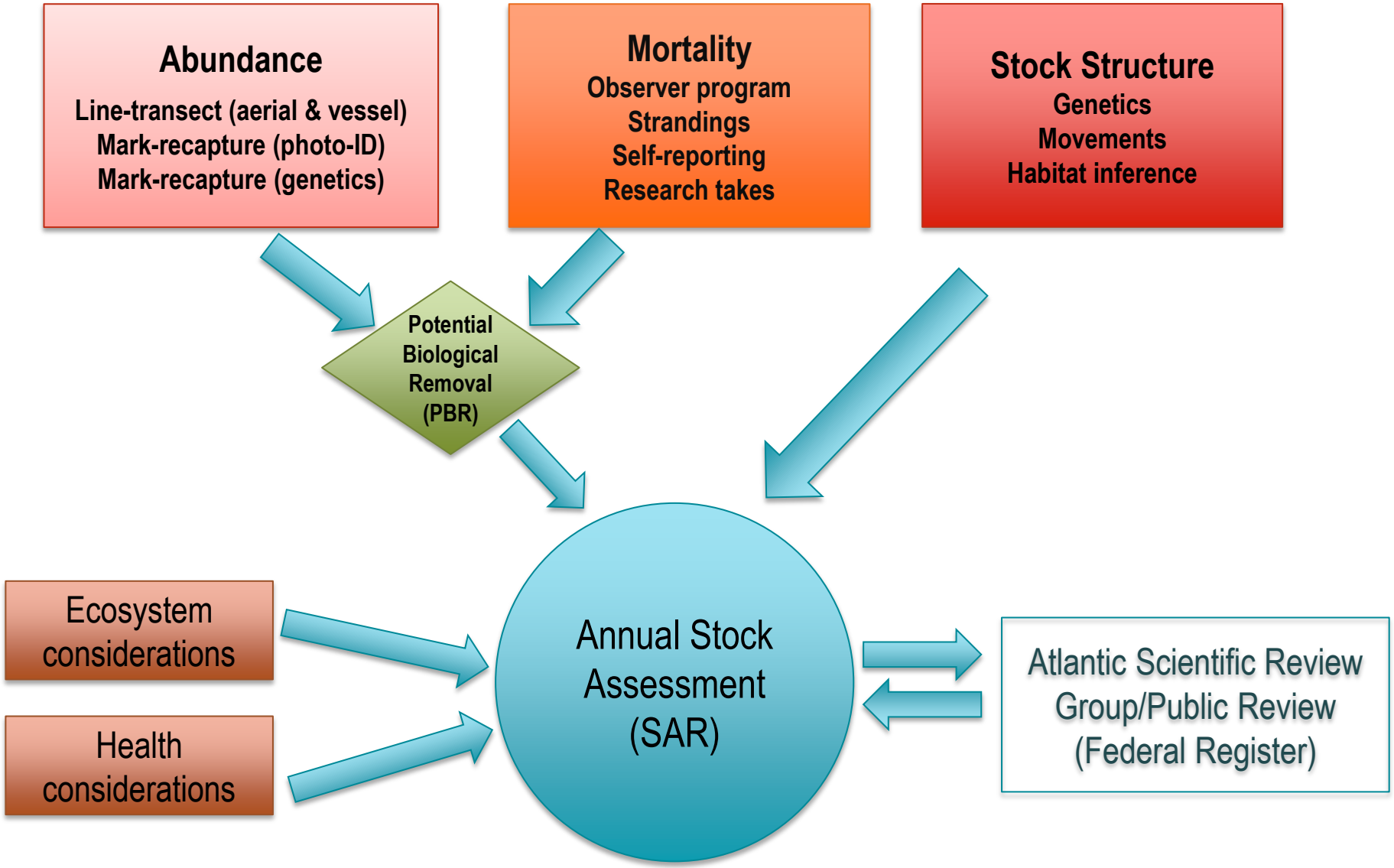
Marine Mammal Abundance and Distribution

Southeast Fisheries Science Center

Protected Species Program Review

August 25-27, 2015

Marine Mammal Stock Assessments



Application of Abundance Estimates

- Potential Biological Removal (PBR) requires an estimate of minimum population size (N_{min}) for each stock.

$$PBR = N_{\min} \cdot \tfrac{1}{2} R_{\max} \cdot F_r$$

- N_{min} is precisely defined in Guidelines for Assessing Marine Mammal Stocks and is precautionary

- If Nmin is > 8 years old, PBR is defined as “unknown”

Standards for Abundance Estimates

Protected Species Stock Assessment Improvement Plan and GPRA performance tier levels

Abundance Estimate Quality

Level 1: Minimum count

Level 2: Unbiased estimate of abundance (CV ≥ 30%)

Level 3: Unbiased estimate of abundance (CV < 30%) with seasonal or geographically explicit density

Level 4: Seasonal and geographic-specific density estimates

Assessment Frequency

Level 1: Most recent assessment ≥ 10 years old

Level 2: Most recent assessment is 6-9 years old

Level 3: Most recent assessment 2-5 years old

Level 4: Most recent assessment ≤ 1 year old

Precision and Accuracy of Estimates

Factors Affecting Precision

- Survey Effort (sample size)
- Stock density/abundance (encounter rate)
- Analytical approach (i.e., spatial modeling)
- **Observer skill and experience**

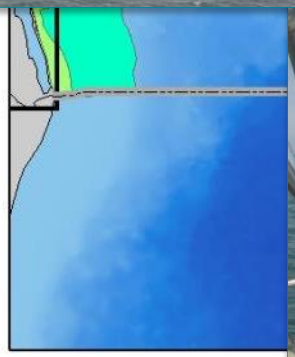
Factors Affecting Accuracy

- Survey design (extent and resolution)
- Accounting for known biases (e.g., visibility bias)
- **Observer skill and experience**

Platforms and Approaches: Habitat Dependent

Coastal and Shelf Stocks: Aerial Surveys

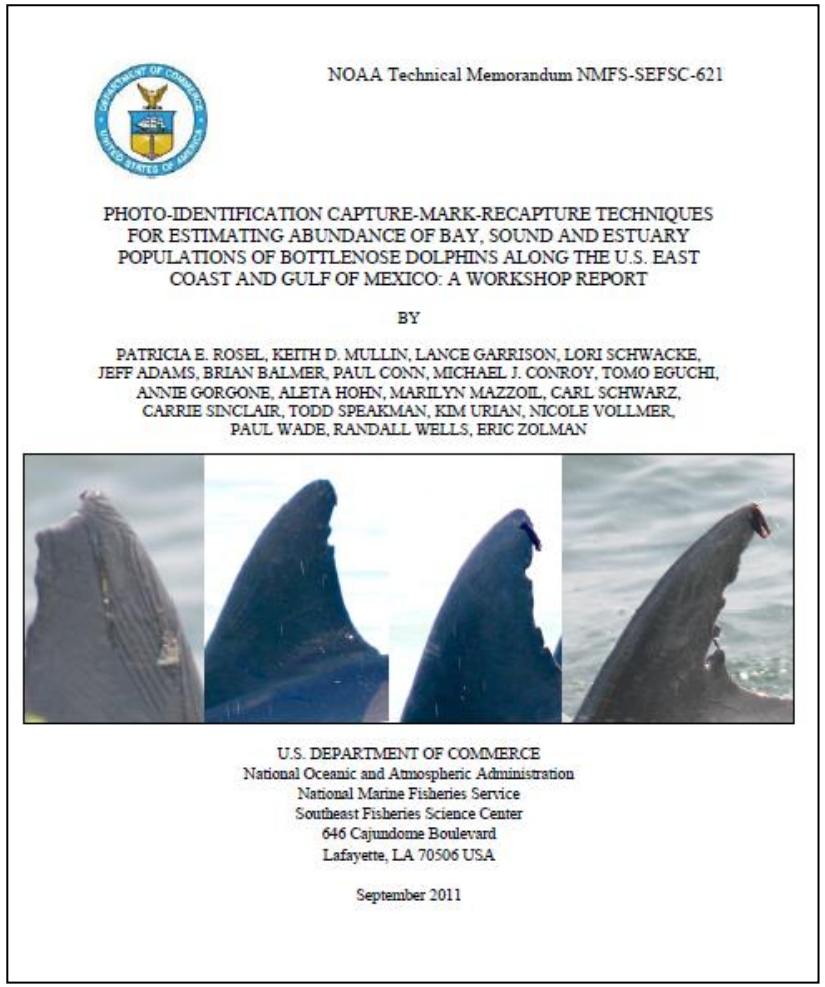
Oceanic Stocks: Large Vessel Surveys



Estuarine Stocks: Photo-id Capture Mark-Recapture Studies

Photo-ID Capture-Mark-Recapture Study Considerations

- Spatial extent
- Photo quality scoring and photo-ID procedures
- Transients and seasonal timing
- Survey design
- Recommend “robust-design”



NOAA Technical Memorandum NMFS-SEFSC-621

PHOTO-IDENTIFICATION CAPTURE-MARK-RECAPTURE TECHNIQUES FOR ESTIMATING ABUNDANCE OF BAY, SOUND AND ESTUARY POPULATIONS OF BOTTLENOSE DOLPHINS ALONG THE U.S. EAST COAST AND GULF OF MEXICO: A WORKSHOP REPORT

BY

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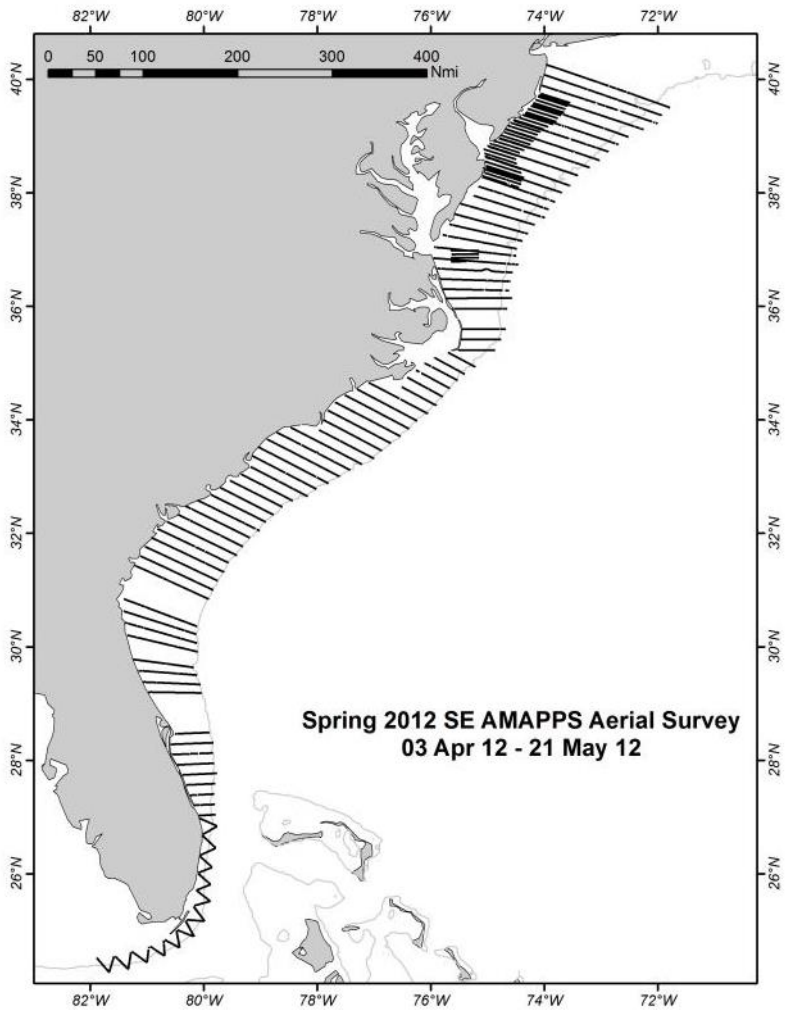
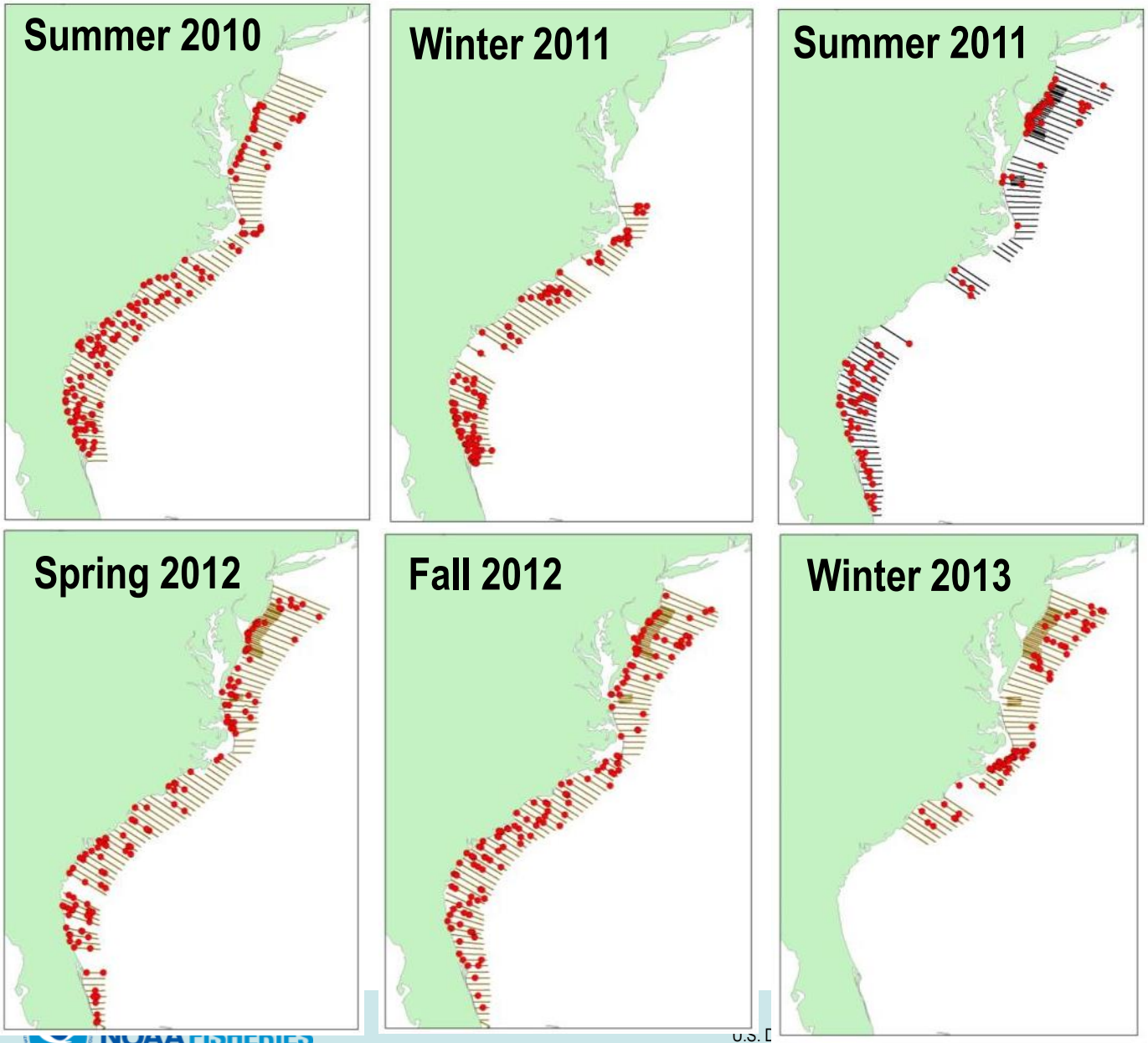
September 2011

Coastal and Shelf Stocks: Aerial Surveys



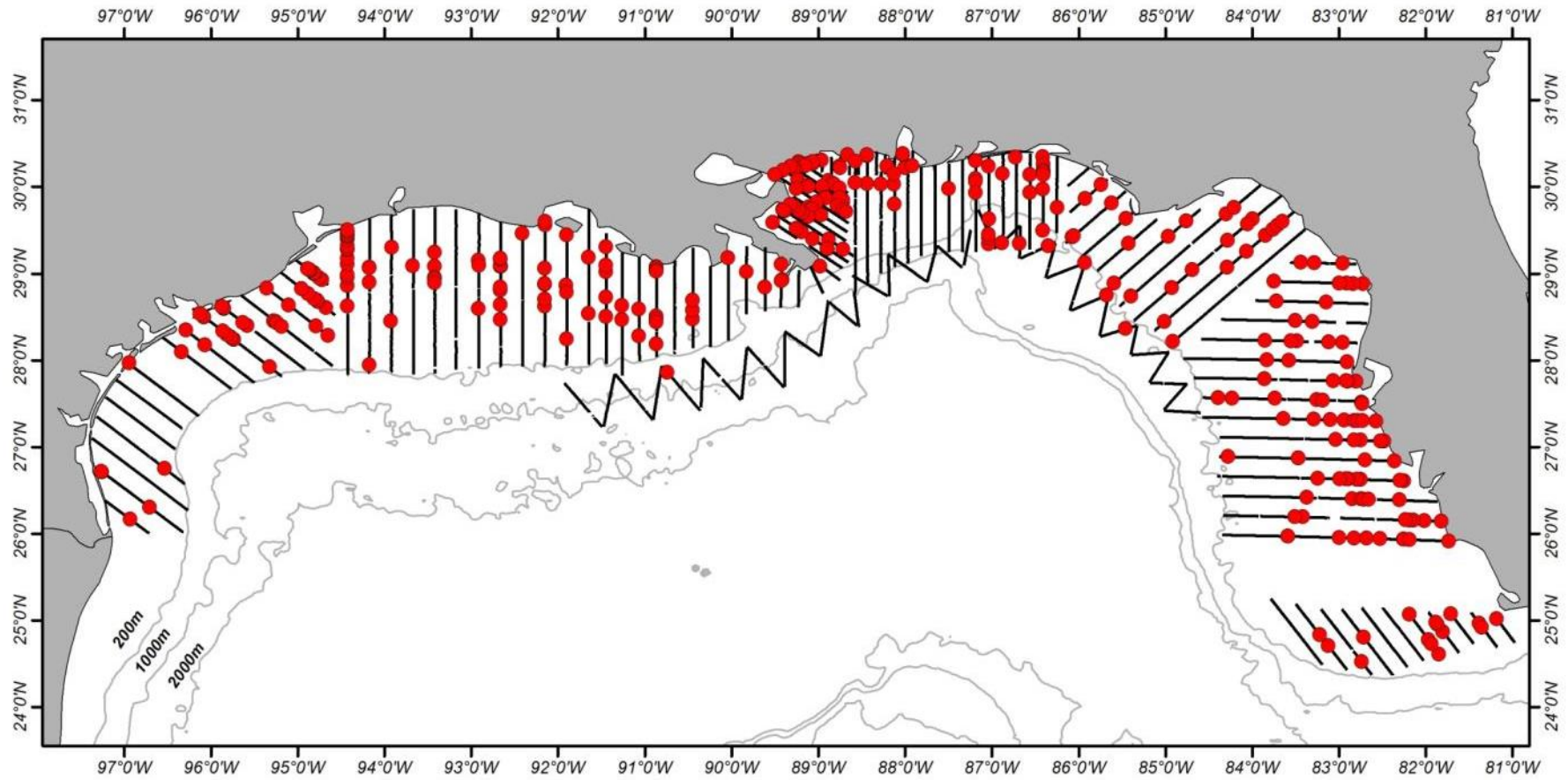
- Visual line-transect surveys
- Two-team method to account for perception bias
- Seasonal surveys
- Primarily bottlenose dolphins and sea turtles

Coastal and Shelf Stocks: AMAPPS



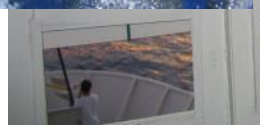
- Seasonal surveys across multiple years
- Focal areas within BOEM "wind" areas
- NEFSC covers northern portion of survey area
- Tracklines include shelf-break region

Coastal and Shelf Stocks: NRDA Aerial Surveys



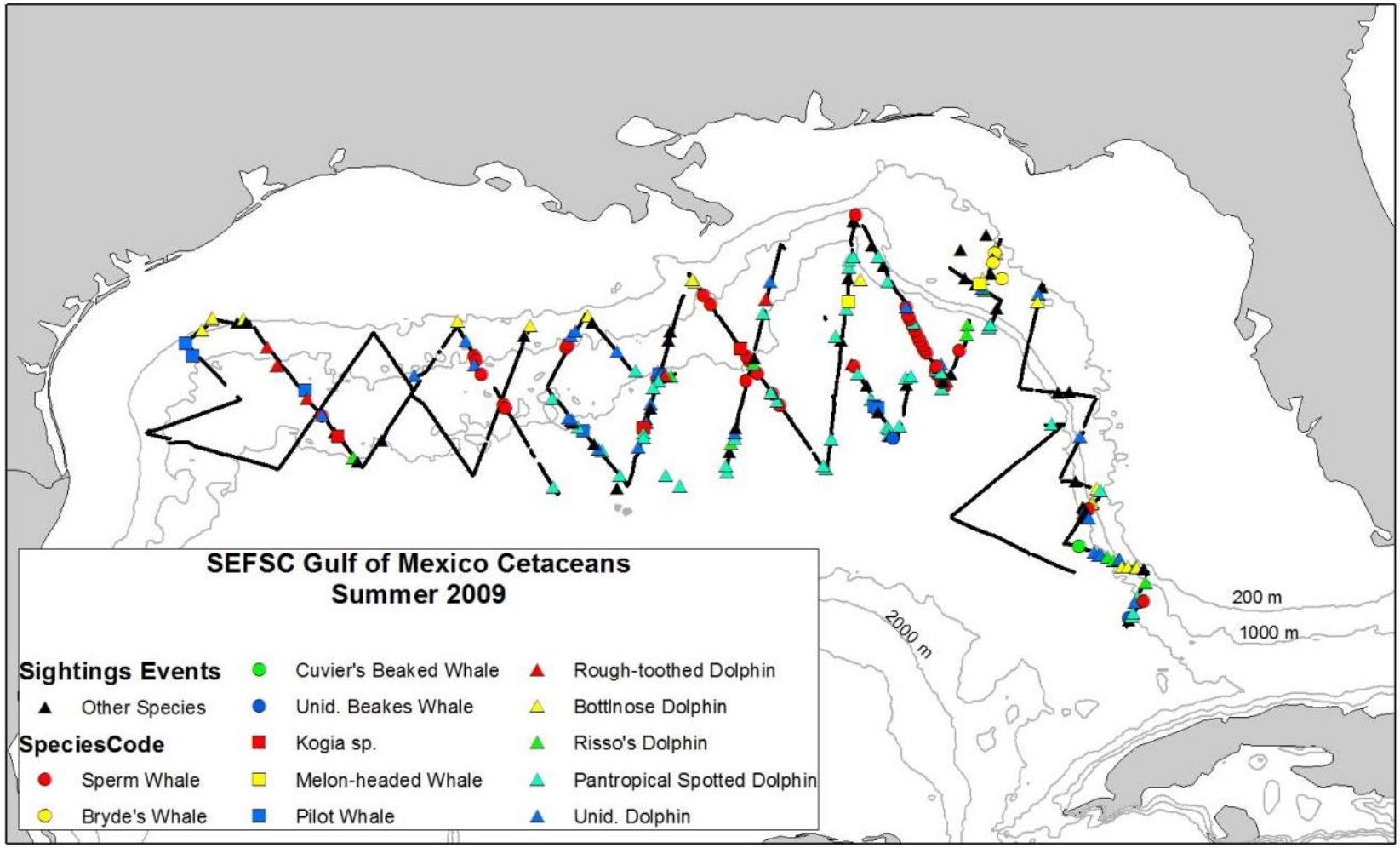
- Spring 2011, summer 2011, fall 2011, and winter 2012
- First Gulf-wide surveys since the early 1990s
- Seasonal abundance estimates for coastal and shelf stocks

Oceanic Stocks: Large Vessel Surveys



- Visual line-transect surveys including independent observer teams
- Passive acoustic sampling through towed arrays and deployment of moored units
- Collection of biopsy samples
- Oceanographic sampling
- Support for trawling, plankton sampling, and tagging

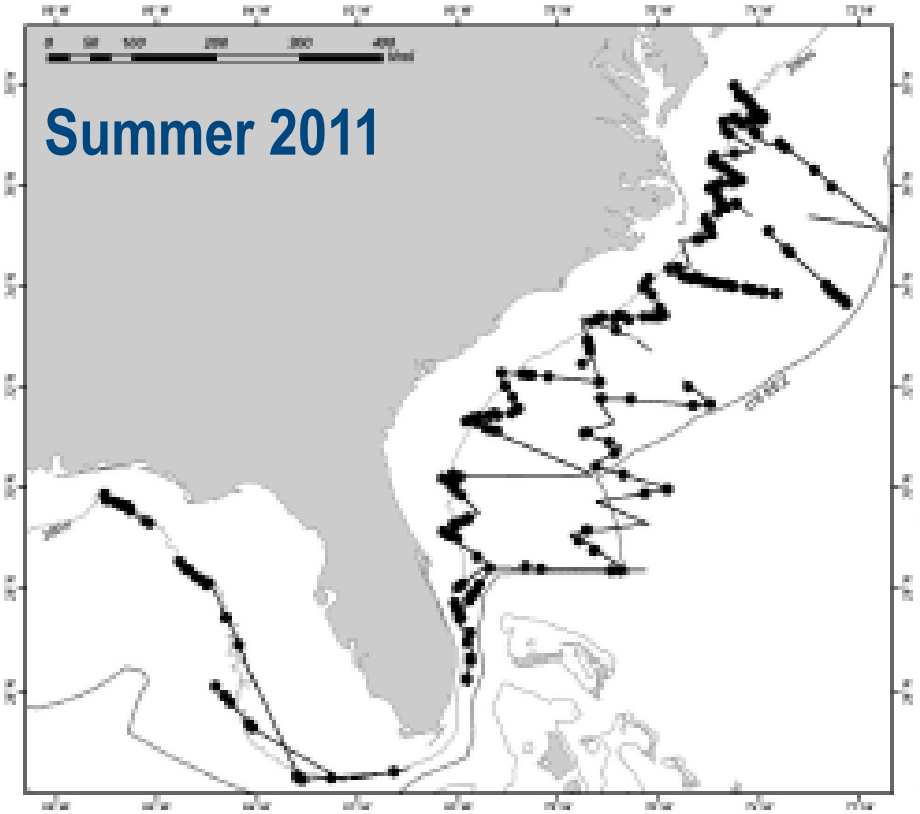
Oceanic Stocks: Large Vessel Surveys



Combined visual and passive acoustic surveys.

Typically 55-60 day surveys with most surveys restricted to summer months.

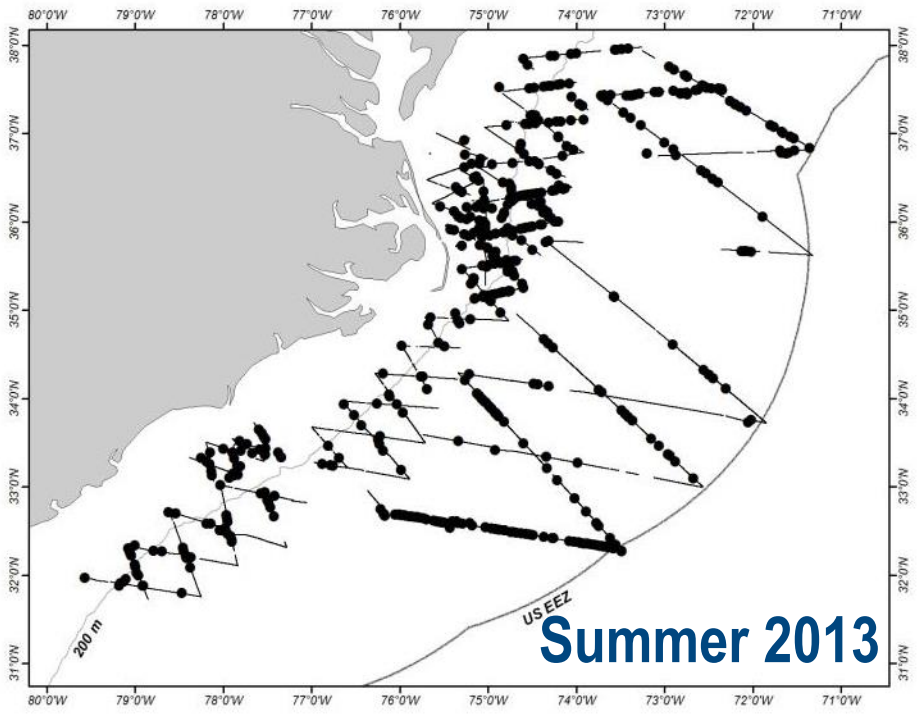
Oceanic Stocks: Large Vessel Surveys



AMAPPS Supported Surveys during summer 2011 and summer 2013

Combined visual/passive acoustic surveys and environmental sampling

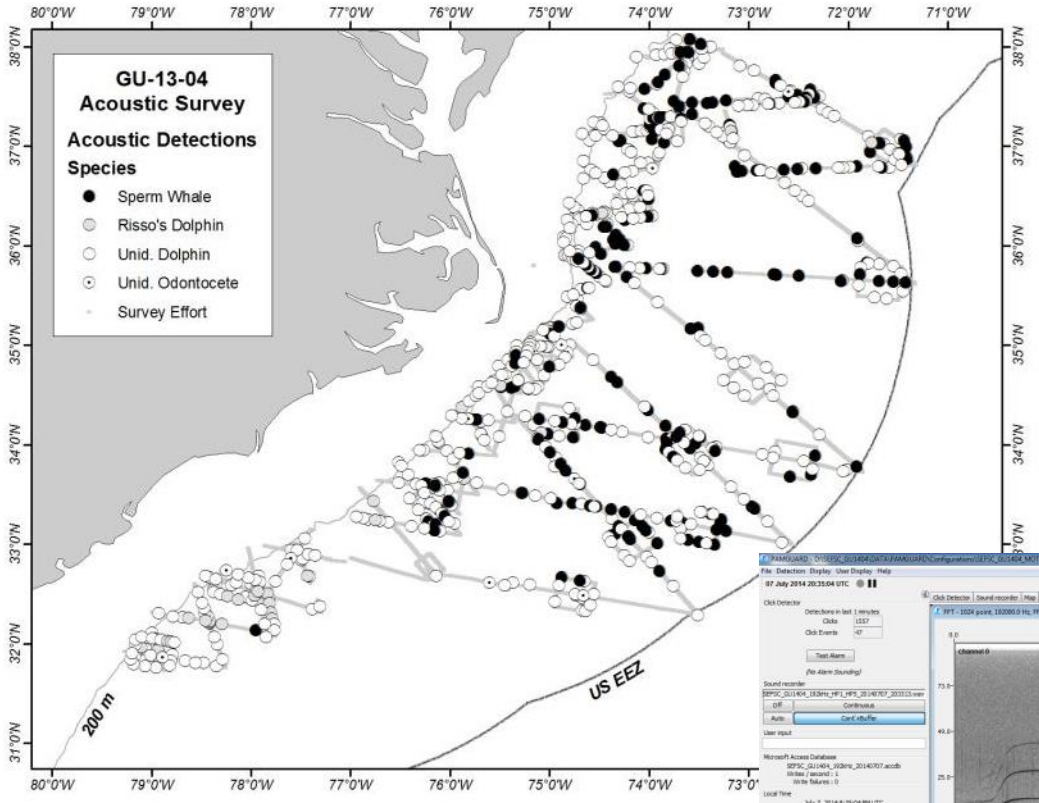
Coordinated with NEFSC to provide coast-wide estimates



Summer 2011 survey used to update Atlantic oceanic stock abundance estimates

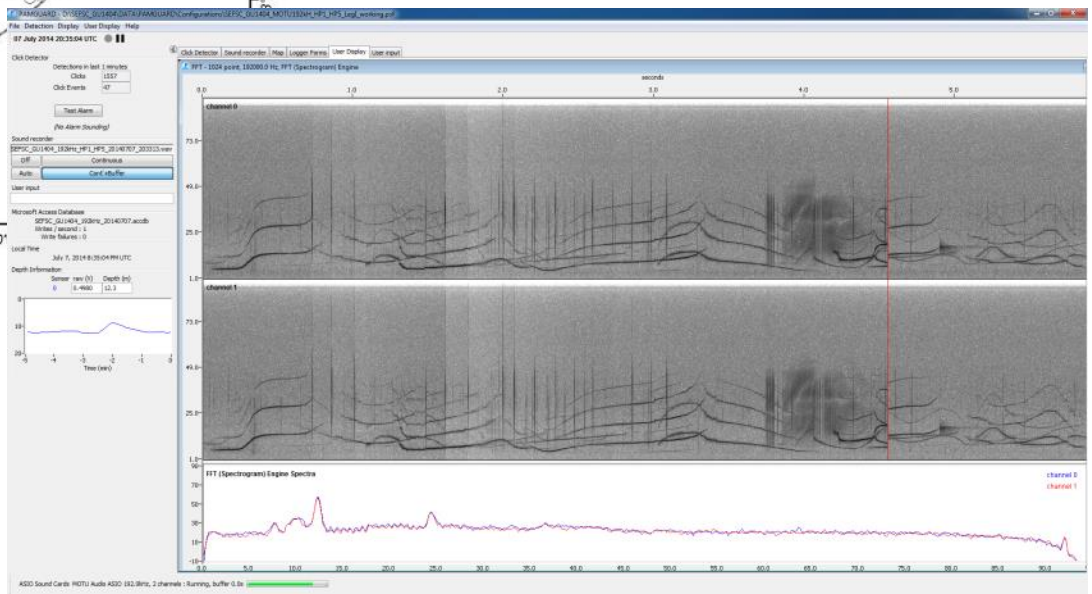
Next survey planned for summer 2016

Oceanic Stocks: Passive Acoustics



Towed hydrophone array concurrent with visual survey and during night/weather periods

Standardization across Science Centers



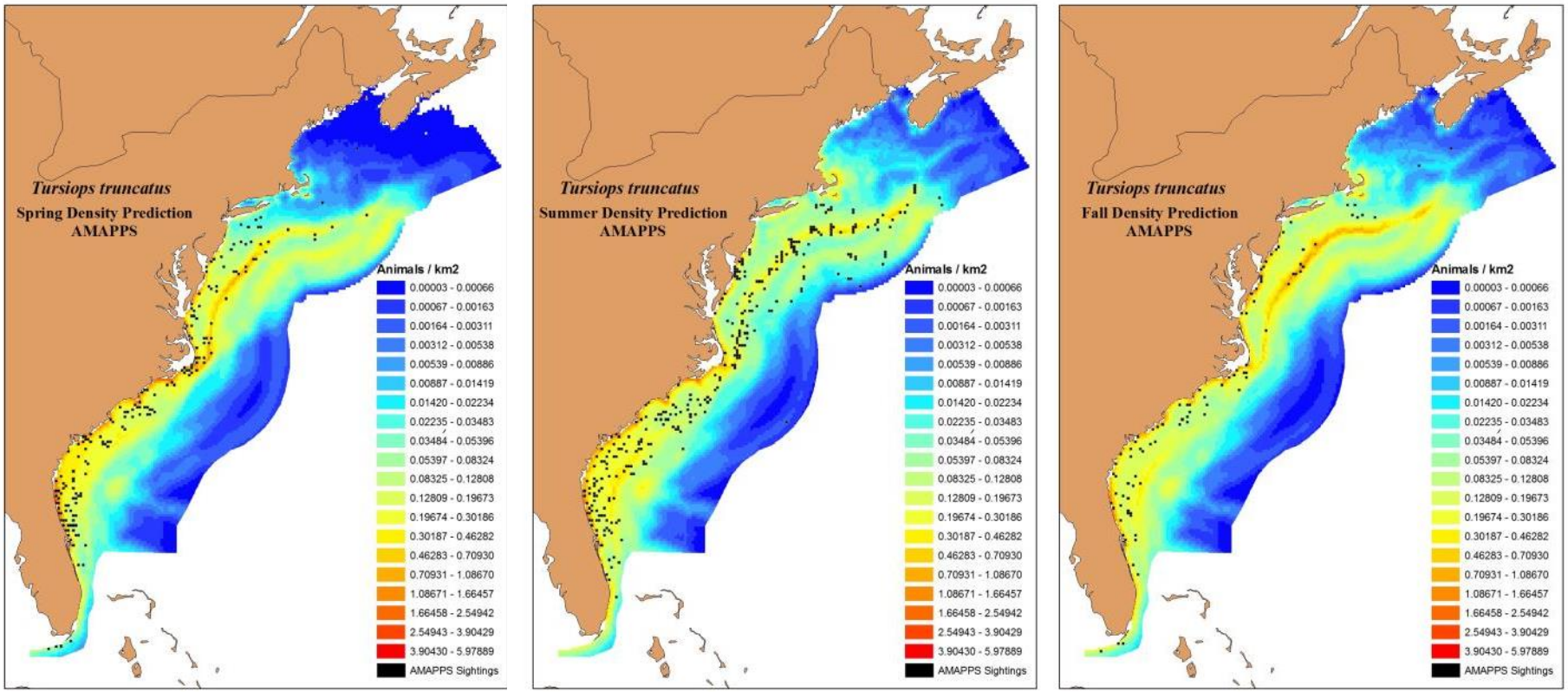
Improvements in detection, classification, and localization improve capabilities

Outcomes: Abundance Estimates

- Atlantic oceanic and shelf stocks abundance estimates from 2011 aerial and vessel surveys, unbiased estimates (**next survey is 2016)**
- Gulf of Mexico oceanic abundance estimates from summer 2009 vessel survey, do not account for visibility bias
- Gulf of Mexico coastal/shelf stocks from 2011-2012 aerial surveys: unbiased estimates
- BSE Stocks (Gulf of Mexico and Atlantic Bottlenose dolphins)
  - Majority with outdated estimates
  - Some Atlantic BSEs with no abundance estimate
  - North Carolina estuarine stocks and several Gulf stocks with recent or forthcoming estimate

Outcomes: Spatially Explicit Density Maps

AMAPPS Product: Bottlenose dolphin density and spatial distribution



- Seasonal maps of density from vessel and aerial survey data (Southeast and Northeast)
- Similar habitat maps developed for Atlantic and Gulf from historical data (Duke University)
- A major Program objective is to produce and disseminate operational mapping products

Abundance Estimation: Strengths

- Effective field leads and strong observer teams
- Access to platforms: Twin Otter and NOAA ships
- Improving and standardizing passive acoustic tools
- Standardized methods for Capture-Mark-Recapture photo-ID studies
- AMAPPS program resulting in seasonal and spatially explicit density estimates for Atlantic coast
- NRDA studies resulting in updated estimates for some Gulf of Mexico stocks
- Making progress on some estuarine stocks

Abundance Estimation: Limitations

- Funding for surveys primarily from external funds; Continuity is challenging
- Limited seasonal coverage
- Difficult to assess estuarine stocks given resources
- Deep-diving species (particularly beaked whales and *Kogia*) are an ongoing challenge
- Limited capacity for rapid dissemination of data/products

Abundance Estimation: Some Ways Forward

- Vessel scheduling/availability
  - ➢ Coordination/vessel sharing with NEFSC
- Assessing estuarine stocks
  - ➢ Prioritization tool (Phillips and Rosel 2014)
  - ➢ Providing standardized methods to partners
- Deep-diving species (particularly beaked whales and *Kogia*)
  - ➢ Integration of dive-surface behaviors
  - ➢ Integration with passive acoustic array and mooring data

Discussion Topics

1. Is the work we are doing reflective of scientific best practices?

2. Do you see an opportunity for SEFSC to shift resources from an existing activity to deal with an unmet need?

3. Are the analyses appropriate for the data collected and the study objectives? Are there other analytical techniques that should be explored?

4. Discuss the major limitations/weaknesses of protected species abundance and distribution studies and how they could be resolved?